Volume 17: 323–328
Publication date: 8 December 2014
dx.doi.org/10.7751/telopea20148041

TELOPEA
Journal of Plant Systematics

The Royal Botanic Gardens & Domain Trust

plantnet.rbgsyd.nsw.gov.au/Telopea • escholarship.usyd.edu.au/journals/index.php/TEL • ISSN 0312-9764 (Print) • ISSN 2200-4025 (Online)

A major range extension of *Blindia robusta* (Seligeriaceae, Bryophyta) based on the type of *Ditrichium tenuinerve*

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Abstract

The endemic species *Ditrichum tenuinerve* Dixon from Tristan da Cunha is taxonomically evaluated and some details of its type material are illustrated. This species shares the diagnostic characters of *Blindia robusta* Hampe and the two species are considered to be conspecific. As a result of this taxonomic conclusion the global range of *B. robusta* is extended to the South Atlantic Ocean and accordingly it has to be considered as a nearly pan-south-temperate, not an amphipacific south-temperate species. The global distribution map for *B. robusta* is presented.

Introduction

Species of *Ditrichum* Hampe are prominent constituents of the moss flora of the Southern Ocean islands and some of them play an important role in the vegetation cover. Therefore the genus gained frequent interest of bryologists and is relatively well studied taxonomically in this region. In the Australasian sector it is represented by three species on subantarctic Macquarie Island (Seppelt 2004) and five on the Auckland and Campbell Islands in the south-cool-temperate zone (Vitt 1974, 1979; Ochyra and Lewis Smith 1998). In contrast, four species of *Ditrichum* have been recorded from subantarctic South Georgia (Ochyra *et al.* 2002) but, surprisingly, the genus exhibits the greatest diversity in the maritime Antarctic where six species have so far been discovered (Ochyra 1999; Ochyra *et al.* 2008a, b; Ellis *et al.* 2013). Finally, in the subantarctic Kerguelen biogeographical province six species are known to occur (Ochyra and Bednarek-Ochyra 2013; Ellis *et al.* 2014).

Ditrichum is also well represented in Tristan da Cunha, an archipelago of three islands in the South Atlantic Ocean situated in the southern cool-temperate zone. So far, five species of this genus have been recorded in this island group, including *D. hyalinum* (Mitt.) Kuntze, *D. conicum* (Mont.) Mitt., *D. strictum* (Hook.f. & Wilson) Hampe, *D. difficile* (Duby) M.Fleisch. and *D. tenuinerve* Dixon (Dixon 1960). The latter is a poorly known species, endemic to Tristan da Cunha, which has not been taxonomically assessed since its inception.

Characterisation and identity of *Blindia tenuinervis*

Ditrichum tenuinerve was described from a single collection made at a high elevation of 2000 m in the upper crater lake by E. Christophersen during the Norwegian expedition of 1937–1938. In a brief diagnosis Dixon (1960) stated that the new species is similar to *D. conicum* from which it differed in the overall habit and subfalcate leaves. He emphasised the characteristic shape of the leaves which consisted a very narrow base

gradually tapering to a long, entire, capillaceous subula. In addition, he noted the characteristic leaf areolation of very narrow, linear basal cells, not differentiated in the angles, becoming only somewhat shorter and opaque distally, and the very narrow costa which was somewhat indistinct at the base.

The overall appearance and leaf shape of *Ditrichum tenuinerve* are adequately described by Dixon (1960). The plants are medium-sized but slender, 1–2 cm tall, lustrous and forming dense, yellowish-brown to yellowish-green mats. The leaves (Figs 1.1–5) are 3.5–4.5 mm long, 0.3–0.5 mm wide at base, and consist of an erect, concave, non-decurrent, oblong-lanceolate, subclasping base, 1.2–1.5 mm long, which is gradually tapered to a fine subula, usually 1.5–2.5(–3) times longer than the base. The subula is entire, flexuose-secund to falcate secund on drying, especially at the stem apex.

The laminal cells of *Ditrichum tenuinerve* are unistratose throughout. They are elongate to elongate-linear in the basal and median part, 60–110 μm long, 7–10 μm wide, with straight and moderately thickened walls and truncate cell ends (Figs 1.7–8). The cells at the shoulders are usually shorter, rectangular, 30–60 μm long, but otherwise similar in shape to the lower cells (Fig. 1.6). The alar cells are either undifferentiated or on some leaves the angular cells are somewhat shorter and wider and form a hint of auricles (Fig. 1.8). The leaf margins are entire and erect to inflexed, as clearly visible in leaf cross-sections (Figs 1.9–15).

The costa is single, yellow-brown, 50–60 μm wide and somewhat diffuse at the base where it is usually not sharply differentiated from the laminal cells. It occupies most of the width of the subula and is excurrent for varying lengths. It is not prominently convex on the abaxial side and in cross-section it is composed of more or less uniform substereid cells arranged in three layers, sometimes with an imperfect fourth layer. The costa lacks a distinct row of guide cells (Figs 1.9–19). The plants are entirely sterile and no sexual organs have been found on the type material.

A set of the gametophyte characters immediately excludes any affinity of *Ditrichum tenuinerve* with *D. conicum*, considered by Dixon (1960) as its closest relative. This species has a very broad costa, 130–160 μm wide at its base, and a completely different leaf areolation of irregular, mostly isodiametric to shortly elongate cells throughout the leaf sheath. Dixon (1960) suggested also the similarity of his new species to *D. hyalinocuspidatum* Cardot, a south Georgian and Antarctic endemic (Ochyra *et al.* 2008a, b). Fertile plants of this species which are known only from maritime Antarctica, from where they were described as *D. lewis-smithii* Ochyra (Ochyra 1996), are immediately distinct in having immersed and eperistomate capsules. However, sterile plants are also readily distinguished by their flexuose leaf subulae, short and isodiametric, mostly rounded, quadrate or rhombic to shortly rectangular and variously bistratose cells at the leaf shoulders, as well as the presence of a distinct row of guide cells in the costa.

The anatomy of the costa clearly precludes any alliance of *Ditrichum tenuinerve* with this genus. Although *Ditrichum* is primarily diagnosed by its sporophyte traits, especially the architecture of the peristome teeth, a characteristic feature of this genus is the presence of a distinct row of enlarged guide cells separating the adaxial and abaxial stereid bands, although in some species the former is absent. On the other hand, the leaf shape and areolation of the sheathing part and the anatomy of the costa suggest the close relationship of *Ditrichum tenuinerve* to the genus *Blindia* Bruch & Schimp.

Blindia is a genus consisting of 19 species (Bartlett and Vitt 1986; Andreas 2013), predominantly distributed in the Southern Hemisphere. The genus is characterised primarily by the sporophyte characters, especially by the presence of the *Seligeria*-type of peristome. However, it is also distinct gametophytically from most genera with a *Dicranum*-like aspect by the costa anatomy, which is composed of uniform substereid cells lacking a distinct row of guide cells, and a characteristic leaf areolation of long-rectangular to linear cells with truncate leaf apices.

The gametophyte characters of *Ditrichum tenuinerve* indicate its identity with *Blindia robusta* Hampe. This species was first recognised as *Dicranum tenuifolium* Hook.f. & Wilson from material collected from Hermite Island near Cape Horn in southern South America (Hooker and Wilson 1844). Since this name was an illegitimate younger homonym, the next available name for this distinct species was *Blindia robusta* Hampe, which was used for a species described from Australia (Hampe 1860). *Blindia robusta* is a very variable species with regard to development of the alar cells. In most populations they are very prominent and form large, coloured or hyaline auricles but in some plants they can be reduced and occupy only a small area in the marginal base of the leaf sheath. Finally, in some populations there is no differentiation of alar cells and the type material of *Ditrichum tenuinerve* clearly represents this group. Interestingly, the type material of *Dicranum tenuifolium* also belongs within this phenotype.

Ditrichum tenuinerve and *Blindia robusta* share the shape of the leaf subula, which is distinctly falcate-secund and 1.5 to 2.5–3 times longer than the sheathing base. The two species are decidedly hygrophilous mosses. Accordingly, the following synonymy is proposed.

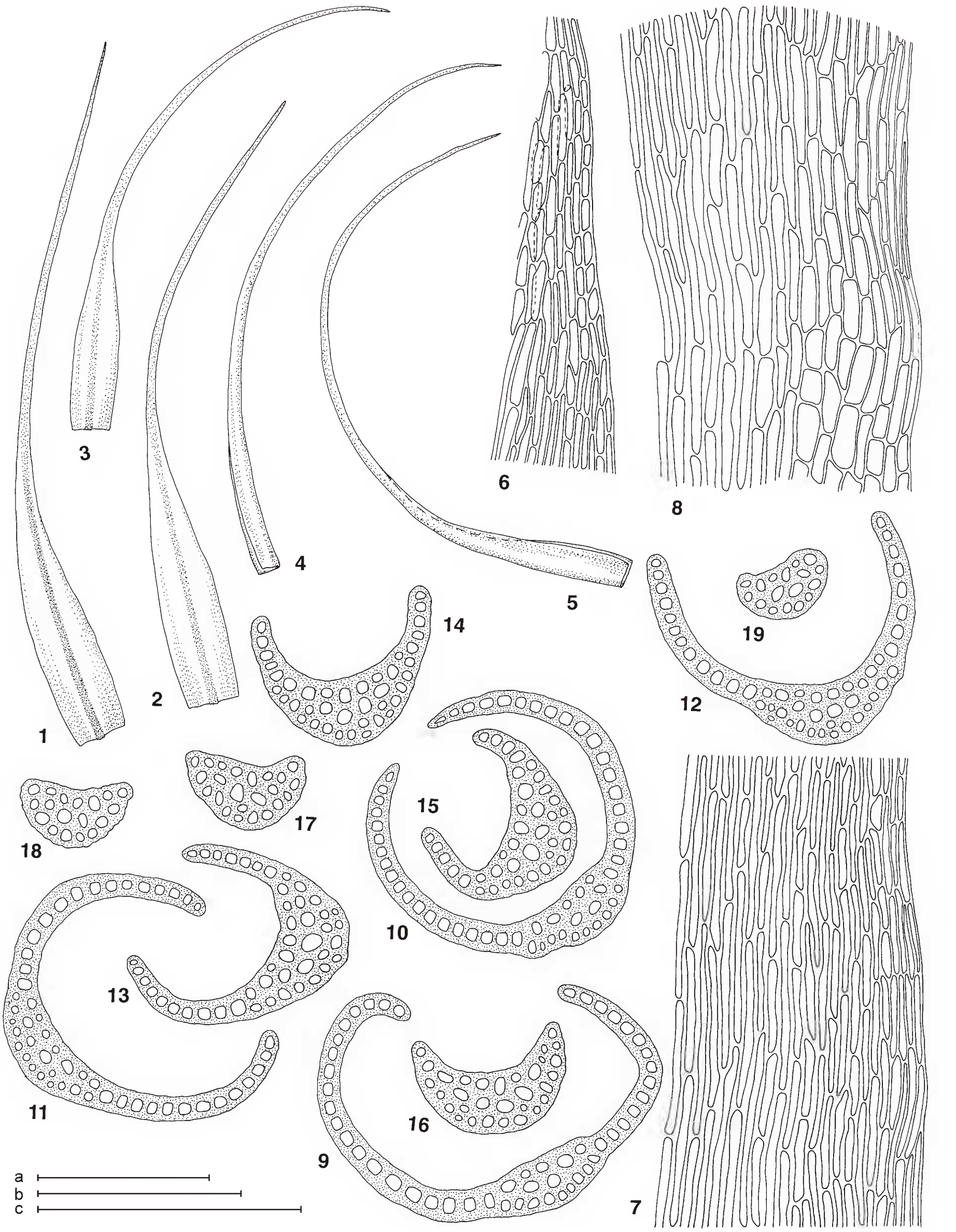

Fig. 1. *Blindia robusta*. **1-5.** Leaves. **6.** Laminal cells at leaf shoulder. **7.** Mid-leaf cells. **8.** Basal and alar cells. **9-19.** Transverse sections of leaves, sequentially from base to apex. (All from *Christophersen 1800b*, FH, isotype of *Ditrichum tenuinerve*). Scale bars: **a**. 100 μm (6-8); **b**. 1 mm (1-5); **c**. 100 μm (9-19).

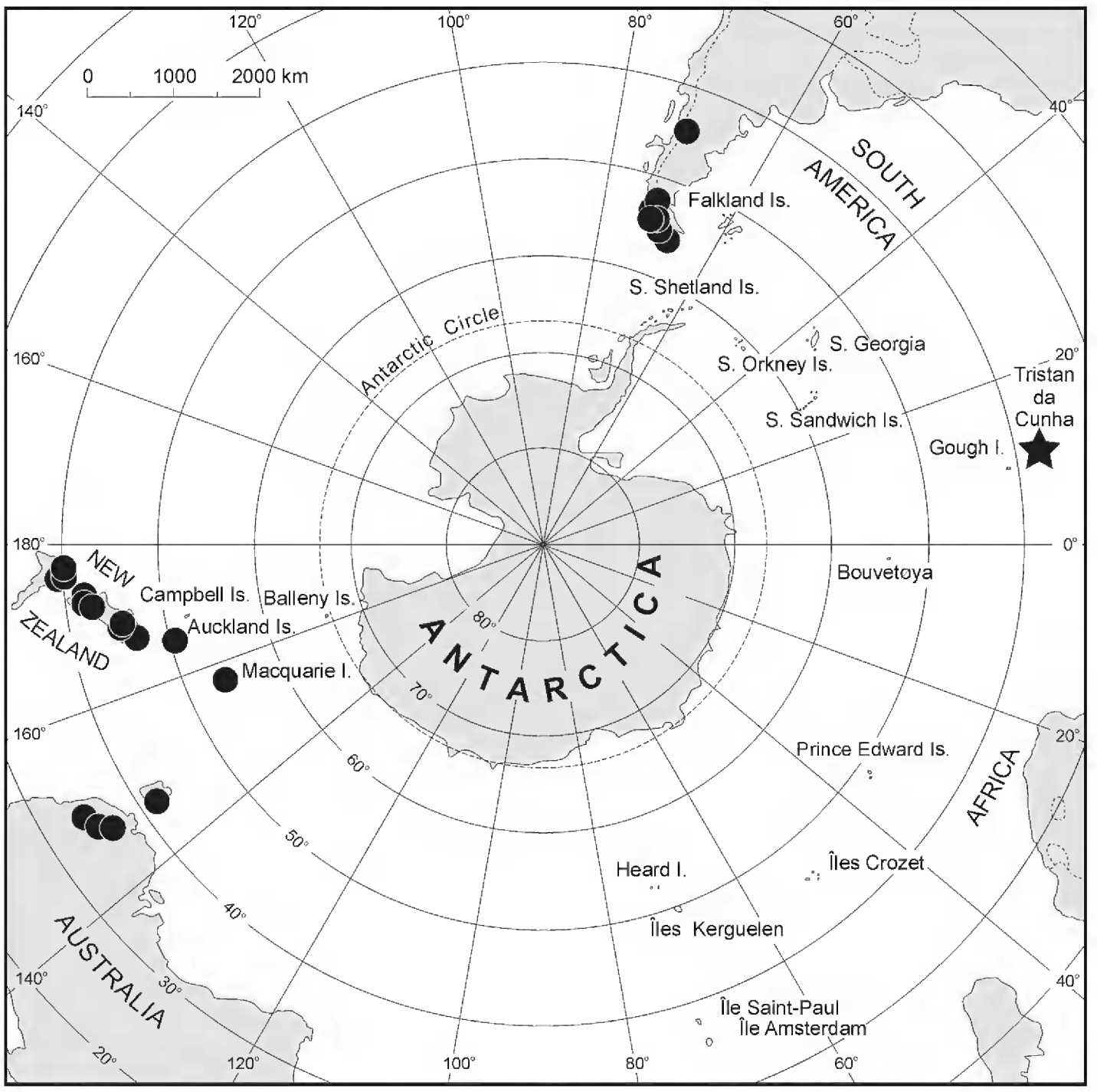

Fig. 2. Global distribution map for *Blindia robusta*. New locality in Tristan da Cunha marked with an asterisk.

Blindia robusta Hampe *Linnaea* 30: 627 (1860).

Type citation: In Alpibus austr., Mountain Munyang.

Lectotype (*vide* Bartlett and Vitt 1986, p. 224): BM-Hampe!; isolecto: BM-Hampe!, BM!].

Ditrichum tenuinerve Dixon, *Results of the Norwegian scientific expedition to Tristan da Cunha* 48: 12 (1960).

Type citation: Tristan da Cunha: Upper crater lake, on beach, circa 2000 m., No. 1800b.

Lectotype (selected here): "Herb. H. N. Dixon Ref. No 1800(b) (f) *Ditrichum tenuinerve* Dix. sp. nov. Upper Crater lake, on beach, Tristan da Cunha c. 2000 m Coll. Christophersen and Mejland 18 Feb 1938 Comm. Bot. Mus., Oslo Type" - BM-Dixon!; isolecto: FH-Bartram! ***syn. nov.***

Phytogeographical consideration

Blindia robusta has so far been considered as an amphipacific south-cool-temperate species (Fig. 2). It is widespread in Australasia where it is relatively common in New Zealand, ranging from southern part of the North Island to the Auckland Islands, on subantarctic Macquarie Island, and rather infrequent in Tasmania and SE Australia (Bartlett and Vitt 1986). On the opposite side of the Pacific Ocean, the species occurs in southern South America, where it is frequent in the Tierra del Fuego archipelago (Greene 1986; Andreas 2013), with an isolated station in Western Patagonia of Chile (Herzog 1954). Other Bryophyta sharing this distribution pattern include *Hypopterygium didyctyon* Müll.Hal., *Lopidium concinnum* (Hook.) Wilson (Kruijer 2002), *Weymouthia mollis* (Hedw.) Broth., *W. billardierei* (Hampe) Broth., *Pyrrhobryum mnioides* (Hook.) Wilson (Seki 1974), *Bucklandiella didyma* (Mont.) Bednarek-Ochyra & Ochyra (Blockeel *et al.* 2008, 2010), *B. elegans* (Müll.Hal.) Bednarek-Ochyra, Ochyra & Seppelt (Ellis *et al.* 2011a), and *B. angustissima* Bednarek-Ochyra & Ochyra (Bednarek-Ochyra and Ochyra 2011).

As a result of the present taxonomic conclusion the phytogeographical status of *Blindia robusta* has to be changed. The discovery of the species in Tristan da Cunha represents a remarkable range extension of this species which, accordingly, should be designated as a nearly pan-south-temperate species. The species is admittedly missing from mainland Africa, but there are a number of species occurring in cool-temperate regions of southern South America which also extend to the Tristan da Cunha group, for example *Hygrodicranum falklandicum* Cardot (Blockeel *et al.* 2007), *Dicranoloma hariotii* (Müll.Hal.) Paris and *D. imponens* (Mont.) Broth. (Dixon 1960), or eventually appearing on subantarctic islands in the South Indian Ocean Province, for example *Bucklandiella heterostichoides* (Cardot) Bednarek-Ochyra & Ochyra (Blockeel *et al.* 2009; Ellis *et al.* 2012a), *B. striatipila* (Cardot) Bednarek-Ochyra & Ochyra (Ellis *et al.* 2010, 2011b, 2012b) and *B. lamprocarpa* (Müll.Hal.) Bednarek-Ochyra & Ochyra (Bednarek-Ochyra and Ochyra 1998).

Acknowledgments

I am grateful to the Curators of the bryophyte herbaria at BM and FH for arranging the type material of *Ditrichum tenuinerve* on loan and to Rod Seppelt, Hobart, Tasmania, for checking the English and valuable comment. This study received financial support from the Polish National Centre of Science through grant No. N N 303 796 940 for the author and, partly, from the statutory fund of the Institute of Botany of the Polish Academy of Sciences in Kraków.

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Manuscript received 1 October 2014, accepted 24 November 2014